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BS NA EN 1999-1-1 (2009) (English): UK National
Annex to Eurocode 9. Design of aluminium
structures. General structural rules

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NA to BS EN 1999-1-1:2007+A1:2009

*Incorporating National Amendment No. 1
and Corrigendum No. 1*



BSI Standards Publication

**UK National Annex to
Eurocode 9: Design of
aluminium structures –
Part 1-1: General structural rules**

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Summary of pages

This document comprises a front cover, an inside front cover,
pages i to ii, pages 1 to 8, an inside back cover and a back cover.

National Annex (informative) to BS EN 1999-1-1:2007+A1:2009, Eurocode 9: Design of aluminium structures – Part 1-1: General structural rules

Introduction

This National Annex has been prepared by BSI Subcommittee, B/525/9, *Structural use of aluminium*. In the UK it is to be used in conjunction with BS EN 1999-1-1, *General structural rules*.

NA to BS EN 1999-1-1:2007+A1:2009 incorporating National Amendment No. 1 supersedes NA to BS EN 1999-1-1:2007, which is withdrawn.

The start and finish of text introduced or altered by National Amendment No. 1 is indicated in the text by tags $\boxed{A_1}$ $\langle A_1 \rangle$. Minor editorial changes are not tagged.

National Amendment No. 1 has been made to reflect Amendment No. 1 to BS EN 1999-1-1:2007.

NA.1 Scope

This National annex gives:

- a) the UK decisions for the Nationally Determined Parameters described in the following subclauses of BS EN 1999-1-1:2007+A1:

— 1.1.2(1)	— 5.2.1(3)	— 8.1.1(2)
— 2.1.2(3)	— 5.3.2(3)	— 8.9(3)
— 2.3.1(1)	— 5.3.4(3)	— $\boxed{A_1}$ A.2 $\langle A_1 \rangle$
— 3.2.1(1)	— 6.1.3(1)	— C.3.4.1(2)
— 3.2.2(1)	— 6.2.1(5)	— C.3.4.1(3)
— 3.2.2(2)	— 7.1(4)	— C.3.4.1(4)
— 3.2.3.1(1)	— 7.2.1(1)	— K.1(1)
— 3.3.2.1(3)	— 7.2.2(1)	— K.3(1)
— 3.3.2.2(1)	— 7.2.3(1)	
- b) the UK decisions on the status of BS EN 1999-1-1:2007+A1 informative annexes; and
- c) references to non-contradictory complementary information.

NA.2 Nationally Determined Parameters

UK decisions for the Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1 are given in Table NA.1.

Table NA.1 UK values for Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1

Subclause	Nationally Determined Parameter	Eurocode recommendation	UK decision
1.1.2(1)	Minimum material thicknesses	a) Components with material thickness not less than 0,6 mm; b) Welded components with material thickness not less than 1,5 mm; c) Connections with: <ul style="list-style-type: none"> – steel bolts and pins not less than 5 mm; – aluminium bolts and pins not less than 8 mm; – rivets and thread forming screws with diameter not less than 4,2 mm 	Use the recommended values.
2.1.2(3)	Options relating to execution allowed by prEN 1090 to suit required reliability level	[None]	BS EN 1090-3:2008, Annex A, lists the clauses where additional information and options need to be specified by the designer. See PD 6705-3 for guidance.
2.3.1(1)	Actions for particular regional or climatic or accidental situations	General actions to be taken from A1 BS EN 1990:2002+A1 A1 , Annex A, and BS EN 1991	Follow the recommendations of the National Annex to BS EN 1990 and the National Annex to BS EN 1991.

Table NA.1 UK values for Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1 (continued)

Subclause	Nationally Determined Parameter	Eurocode recommendation	UK decision
3.2.1(1)	Use of aluminium alloys and tempers not listed in 3.2.1, Table 3.1a and Table 3.1b	[None]	To enable the use of materials held in stock which were produced prior to the adoption of European material standards, it is permitted to use aluminium alloys listed in the British Standards tabulated in PD 6702-1. This provision is subject to approval of the designer and the use of the values for 0.2% proof stress and minimum tensile strength given in PD 6702-1 for the alloy in question, rather than the values in BS EN 1999-1-1:2007+A1, Table 3.2a, Table 3.2b and Table 3.2c, when calculating the design resistance of the relevant material.
3.2.2(1)	Rules for application of electrically welded tubes produced to BS EN 1592-1 to BS EN 1592-4	Buckling class B (Product properties are not listed)	The tube can conservatively be treated as having a longitudinal weld laid with the MIG process for its full length, and with buckling class B when using BS EN 1999-1-1:2007+A1, 6.1.4.4, 6.1.5, and 6.3.1.
3.2.2(2)	Rules for the reduction of characteristic strength values at service temperatures between 80 °C and 100 °C	Characteristic resistance values may be reduced using formula 3.1	Use the recommended procedure, subject to confirmation that the alloy is suitable for use at the relevant temperature. <i>NOTE Certain alloys are susceptible to stress corrosion cracking at elevated temperatures – e.g. see C.2.2.2 relating to EN AW-5083.</i>
3.2.3.1(1)	Rules for the quality requirements for castings	Rules given in C.3.4 (for gravity castings)	Use the recommendations given in Annex C.
3.3.2.1(3)	Provisions for the use of aluminium bolts and solid rivets	Provisions given in Annex C (for bolts listed in 3.4)	Use the recommendations given in Annex C.

Table NA.1 UK values for Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1 (*continued*)

Subclause	Nationally Determined Parameter	Eurocode recommendation	UK decision
3.3.2.2(1)	Rules for preloaded bolts other than classes 8.8 and 10.9	[None]	To enable the use of (HSFG) bolts held in stock which were produced prior to the adoption of European material standards, it is permitted to use bolts listed in the British Standards tabulated in PD 6702-1. This provision is subject to approval of the designer and the use of the relevant values for preload rather than the standard values given in BS EN 1090-2 and BS EN 1090-3.
5.2.1(3)	Global mode elastic instability criterion α_{cr} for neglecting the influence of second order effects	$\alpha_{cr} = \frac{F_{cr}}{F_{Ed}} \geq 10$	Use the recommended value.
5.3.2(3)	Design values of initial bow imperfections for flexural buckling	Values given in Table 5.1	Use the recommended values.
5.3.4(3)	Initial imperfection factor k to be used for second order analysis taking account of lateral torsional buckling	$k = 0,5$	Use the recommended value.
6.1.3(1)	Ultimate limit state (ULS) partial safety factors	$\gamma_{M1} = 1,10$ $\gamma_{M2} = 1,25$	Use the recommended values.
6.2.1(5)	Critical point yield criterion C for the resistance of cross-sections	$C = 1,2$	Use the recommended value.
7.1(4)	Further guidance on plastic redistribution of moments and force at serviceability limit state	[None]	Certain members might experience permanent strains from serviceability loadings if designed to maximum utilization at the ultimate limit state. It is recommended that extreme fibre stresses are checked at serviceability loads for members subject to combined axial and bending effects. Further guidance is given in PD 6702-1.

Table NA.1 UK values for Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1 (continued)

Subclause	Nationally Determined Parameter	Eurocode recommendation	UK decision
7.2.1(1)	Building vertical deflection limits	[None]	Certain values are given in BS EN 1990 and the National Annex to BS EN 1990. PD 6702-1 gives further guidance.
7.2.2(1)	Building horizontal deflection limits	[None]	Certain values are given in BS EN 1990 and the National Annex to BS EN 1990. PD 6702-1 gives further guidance.
7.2.3(1)	Building dynamic effects limits for the vibration of floors	[None]	Certain values are given in BS EN 1990 and the National Annex to BS EN 1990. The National Annex to BS EN 1995 also gives values and guidance. PD 6702-1 gives further guidance.
8.1.1(2)	Partial safety factors γ_M for joints	Values given in Table 8.1	Use $\gamma_{Mw} = 1,35$. For other safety factors use the recommended values.
8.9(3)	Provisions for joining methods other than those specified in Clause 8	[None]	Refer to PD 6702-1 and PD 6705-3 for other processes such as friction stir or laser welding.
A1 A.2	Rules for the application of consequence classes and reliability classes and for the connection between them and requirements for design supervision	Recommendations given in BS EN 1990:2002+A1, Annex B	The use of Annex A is not recommended. Refer to PD 6702-1 for applicable recommendations for execution classes and reliability differentiation. A1
C.3.4.1(2)	Partial safety factors γ_M for castings	$\gamma_{Mo,c} = 1,1$ and $\gamma_{Mu,c} = 2,0$ for buildings	Use the recommended values for elements of buildings that are not subject to vibrations or to fatigue loading. For all other cases, castings should only be used if proven for the specific application by rigorous testing in accordance with A1 BS EN 1990:2002+A1, Annex D. A1

Table NA.1 UK values for Nationally Determined Parameters described in BS EN 1999-1-1:2007+A1 (*continued*)

Subclause	Nationally Determined Parameter	Eurocode recommendation	UK decision
C.3.4.1(3)	Partial safety factors γ_M for bearing resistance in castings with bolts and rivets	$\gamma_{M2,cu} = \gamma_{Mu,c} = 2,0$ and $\gamma_{M2,co} = \gamma_{Mo,c} = 1,1$ for buildings	Use the recommended values for elements of buildings that are not subject to vibrations or to fatigue loading. For all other cases castings should only be used if proven for the specific application by rigorous testing in accordance with NA BS EN 1990:2002+A1, Annex D. NA
C.3.4.1(4)	Partial safety factors γ_M for bearing resistance in castings with pin connections	$\gamma_{Mp,cu} = \gamma_{Mu,c} = 2,0$ and $\gamma_{Mp,co} = \gamma_{Mp} = 1,25$ for buildings	Use the recommended values for elements of buildings that are not subject to vibrations or to fatigue loading. For all other cases castings should only be used if proven for the specific application by rigorous testing in accordance with NA BS EN 1990:2002+A1, Annex D. NA
K.1(1)	Rules where shear lag in flanges may be neglected at ULS	$b_0 < L_e / 50$ for support regions, cantilevers and regions with concentrated load, and $b_0 < L_e / 15$ for sagging bending regions.	Use the recommended values.
K.3(1)	Method for determining shear lag effects at ULS	Elastic method for calculation of shear lag effects	Use the recommended method.

NA.3 Decisions on the status of informative annexes

UK decisions on the status of informative annexes in BS EN 1999-1-1:2007+A1 are given in Table NA.2.

Table NA.2 UK decisions on the status of informative annexes in BS EN 1999-1-1:2007+A1

Annex	Description	UK decision
A1 Annex A	Reliability differentiation	Not recommended – PD 6702-1 provides guidance that is acceptable for use in the UK A1
Annex C	Materials selection	May be used
Annex D	Corrosion and surface protection	May be used
Annex E	Analytical models for stress strain relationship	May be used
Annex F	Behaviour of cross-sections beyond the elastic limit	May be used
Annex G	Rotation capacity	May be used
Annex H	Plastic hinge method for continuous beams	May be used
Annex I	Lateral torsional buckling of beams and torsional or torsional-flexural buckling of compressed members	May be used
Annex J	Properties of cross sections	May be used
Annex K	Shear lag effects in member design	May be used
Annex L	Classification of joints	May be used
Annex M	Adhesive bonded connections	May be used

NA.4 References to non-contradictory complementary information

BS EN 1999-1-3 is referenced in BS EN 1999-1-1:2007+A1. The following references contain non-contradictory complementary information for use with BS EN 1999-1-3.

PD 6702-1, **A1** *Structural use of aluminium – Part 1: Recommendations for the design of aluminium structures to BS EN 1999 **A1***

PD 6705-3, **A1** *Structural use of steel and aluminium – Part 3: Recommendations for the execution of aluminium structures to BS EN 1090-3 **A1***



Bibliography

Standards publications



For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.



BS EN 1090-2, *Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures*

BS EN 1090-3:2008, *Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures*

 BS EN 1990:2002+A1:2005, *Eurocode 0 – Basis of structural design* 

BS EN 1991 (all parts), *Eurocode 1: Actions on structures*

 PD 6702-1, *Structural use of aluminium – Part 1: Recommendations for the design of aluminium structures to BS EN 1999* 

 PD 6705-3, *Structural use of steel and aluminium – Part 3: Recommendations for the execution of aluminium structures to BS EN 1090-3* 

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